



***Storm Water Verification***  
***for***  
***Better Together Animal Alliance***  
***ACE # 22-091***

**Located In:**

**Ponderay, ID**

**Bonner County, Idaho**



*Sm 22-095*  
**RECEIVED**

**JAN 30 2023**

**PLANNING  
CITY OF PONDERAY**

***January 27, 2023***

**Prepared By: KLS**

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## Storm Water Calculation Verification

The existing open space at the NE area of the Better Together Animal Alliance facility (BTAA) measures about 75' x 100' in dimensions and has an existing Storm Swale just to the east of the open space with a bottom area of 1139 ft<sup>2</sup> with side slopes of 3:1. Stormwater calculations show a required amount of treatment for the 75' x 100' area to be about 615 ft<sup>2</sup> which is considerable smaller than the existing 1139 ft<sup>2</sup> assigned to the swale.

While performing the stormwater calculation for the North Most Area of the Thrift Store/Animal Care Facility where the 6" storm line stops and is connected to 2 roof drains. Results from this calculation show all the storm water that is shed from the west most side of the Thrift Store/Animal Care Facility, yields an amount of  $Q_{IN}=0.08\text{ft}^3/\text{sec.}$  (0.60 gals/sec.). Using the Chezy-Manning equation it was revealed that with the current design specification of  $S=0.005$  and with a 6" dia., the pipe could convey about  $0.58\text{ft}^3/\text{sec.}$  (4.3 gals/sec.) of water to the Existing West Swale. This 6" dia. pipe has plenty of capacity to carry this water all the way to this swale.

At the NW center of the (BTAA) campus, there is the proposed 65' x 50' Storage Building that will be built. Stormwater calculation reveals the 5400 ft<sup>2</sup> lot with the 3250 ft<sup>2</sup> Storage Building on it will require a swale area of about 180 ft<sup>2</sup>. The existing swale at the SW portion of the site is configured with a bottom area of about 3227 ft<sup>2</sup>. The plans show a 6" PVC storm pipe with a Slope = 0.005 flowing from the north to the south. Using the Chezy-Manning equation it was revealed that at  $S=0.005$  and with a 6" dia., the pipe under conditions of only gravity, could convey about  $0.58\text{ft}^3/\text{sec.}$  (4.3 gals/sec.) of water to the SW swale. The discharge produced at this building is  $Q_{IN}=0.08\text{ft}^3/\text{sec.}$  (0.60 gals/sec.)

The swale located at the southwest most area of the site has a 6" storm line that is constructed to the northern most reaches of the Thrift Store building. The half of the Thrift Store closest to the 6" storm line was calculated for the first flow contribution, it was  $Q_{IN}=0.06\text{ft}^3/\text{sec.}$  (0.45 gals/sec.). The last contributing structure to deliver water to the 6" PVC storm line is the west half of the southern most Thrift Store building and it delivers a  $Q_{IN}=0.06\text{ft}^3/\text{sec.}$  (0.45 gals/sec.). With the three contribution points for storm water  $Q_{TOTAL}= 0.22\text{ft}^3/\text{sec.}$  (1.50 gals/sec.).

The last issue that was checked was the capacity of the 6" PVC storm line that runs from the southwest most swale with a pond bottom of 3227 ft<sup>2</sup>. In the 2<sup>nd</sup> paragraph of this report the Chezy-Manning equation was used to show that with a slope of  $S=0.005$  and with a 6" dia., the pipe under conditions of only gravity, has a capacity of about  $Q_{IN}=0.58\text{ft}^3/\text{sec.}$  (4.3 gals/sec.). to the SW swale.

1/23/2023 Amendment KLS:

In reviewing the documentation of this assignment, It is my understanding that the Stormwater Report of 8/15/2007 Submitted by Damon A. Smith, P.E. is to be amended to reflect the addition of an impervious area for the site. In evaluating this assignment starting with the plan sheet C-100 I noticed some discrepancies in the documentation as I began to look closely at the plan sheets. I began with plan sheet C-100 in the title block where I notice that ALSC is the Architect of Record with a date of 8/15/2007 and the plan sheet is called Existing Survey sheet. At the top center of the 11" x 17" plan sheet the top parcel is listed as "City Parcel" and



has an acreage of 3.54 acres (154,202.40 ft<sup>2</sup>). At the bottom center of the same 11" x 17" plan sheet the lower parcel is listed as "Animal Shelter Parcel" and has an acreage of 5.48 acres (238,709 ft<sup>2</sup>). These two combined areas result in a total of 9.02 acres (392,911 ft<sup>2</sup>) for the entire site. I performed an area check for each basin region using the enclosed 11" X 17", "Hand Drawn" Pre-Developed Basin Map I was provided with. The use of a document this size to independently calculate areas accurately and precisely could be a reason for some of the results computed. The following is a breakdown of how the 8/15/2007 Stormwater water report has listed each corresponding name & storm water basin area:

McNearney Basin Total Drainage Area = 13,920 ft<sup>2</sup>

ACES Check = 13,905 ft<sup>2</sup>

Exist. North Basin Total Drainage Area = 189,897 ft<sup>2</sup>

ACES Check = 191,565 ft<sup>2</sup>

Exist. West Basin Total Drainage Area = 101,528 ft<sup>2</sup>

ACES Check = 108,167 ft<sup>2</sup>

Exist. East Basin Total Drainage Area = 104,861 ft<sup>2</sup>

ACES Check = 101,560 ft<sup>2</sup>

TOTAL = 410,206 ft<sup>2</sup>

TOTAL = 415,197 ft<sup>2</sup>

Since the entire area of the site is only 392,911 ft<sup>2</sup>, I was concerned about my finding and did several iterations of checks when I decided this bring this to the attention of my employer. When there is an overage of 17,295 ft<sup>2</sup> of area that cannot be accounted for, is the time to take a closer look. The use of a relatively small 11" x 17" depiction of 4 Pre-Developed Basin Maps could have an effect on the accuracy of such calculations. I did my own area checks with 11" X 17", "Hand Drawn" Pre-Developed Basin Map provided me and my results for the overall drainage area totals were even higher than Mr. Smith's 410,206 ft<sup>2</sup>. One other area that I would like to mention, there are two roof drains on the Thrift store at the NW edge of the building that both feed into a 6" storm pipe. The origin of this water is in the Existing North Basin, yet it is being piped to the Existing West Basin. It is my understanding when sizing up swales from a particular basin, all the water captured for treatment should be conveyed and treated in the swale assigned to that basin and not piped to an external swale in another basin. This convention makes it easier to manage the calculation when all inputs and constraints are in the same basin.

1/28/2023 Amendment KLS:

This amendment is a response to Jason Cates telephone inquiry of 1/24/2023 regarding the inquiry into new updated stormwater drawings as to the correct representation of the drainage areas and swales sizes.

I used the Plan Sheet C-100 from ALSC (Existing Survey Sheet) to start from scratch with a scale of 30, I found several property distance call outs and constructed a brand-new basin map for all 4 predeveloped basins. I did several iterations to ensure I had a more representative basin map that was constructed with property line call outs being used for constant checks.

Again, I started with the City Parcel listing of 3.54 acres + the Animal Shelter amount of 5.48 acres. The sum of these two parcels is 9.02 acres (392,911.20 ft<sup>2</sup>). In the iteration I produced a much more accurate four basin



map so if I encountered a question, I could verify it more easily than the hand drawn basin map I used prior. As careful as I was in my calculation, I still ended up with considerable error.

<i>Damon A. Smith, P.E. 8/15/2007 Report</i>	<i>ACES 1/23/2023 Report</i>	<i>ACES 1/27/2023 Report</i>
McNearney Basin <sub>Total Drainage Area</sub> = 13,920 ft <sup>2</sup>	ACES Check = 13,905 ft <sup>2</sup>	ACES Check = 18,623 ft <sup>2</sup>
Exist. North Basin <sub>Total Drainage Area</sub> = 189,897 ft <sup>2</sup>	ACES Check = 191,565 ft <sup>2</sup>	ACES Check = 188,194 ft <sup>2</sup>
Exist. West Basin <sub>Total Drainage Area</sub> = 101,528 ft <sup>2</sup>	ACES Check = 108,167 ft <sup>2</sup>	ACES Check = 96,372 ft <sup>2</sup>
Exist. East Basin <sub>Total Drainage Area</sub> = 104,861 ft <sup>2</sup>	ACES Check = 101,560 ft <sup>2</sup>	ACES Check = 92,099 ft <sup>2</sup>
TOTAL = 410,206 ft <sup>2</sup>	TOTAL = 415,197 ft <sup>2</sup>	TOTAL = 395,287 ft <sup>2</sup>

With the combined parcels yielding of 9.02 acres (392,911 ft<sup>2</sup>) my new assessment of the 4 Basins resulted in an overage of 2376 ft<sup>2</sup> which is 0.06%. This is an area the size of 48.74' x 48.74', a much more acceptable difference.

I also checked the swale sizes that are shown on the plans starting with the one at the SW most part of the project. I tabulated the swales areas in a counterclockwise direction ending up at the NE most part of the site. The measurements listed per each swale were used in the calculation.

<i>Damon A. Smith, 8/15/2007 Report</i>	<i>ACES 1/26/2023 Report</i>
Swale 1 = 3227 ft <sup>2</sup>	ACES Swale 1 Check = 2921 ft <sup>2</sup>
Swale 2 = 1277 ft <sup>2</sup>	ACES Swale 2 Check = 1200 ft <sup>2</sup>
Swale 3 = 2080 ft <sup>2</sup>	ACES Swale 3 Check = 2206 ft <sup>2</sup>
Swale 4 = 3705 ft <sup>2</sup>	ACES Swale 4 Check = 3960 ft <sup>2</sup>
Swale 5 = 1139 ft <sup>2</sup>	ACES Swale 5 Check = 1157 ft <sup>2</sup>
Swale 6 = 3022 ft <sup>2</sup>	ACES Swale 6 Check = 1417 ft <sup>2</sup>
Swale 7 = None given.	ACES Swale 7 Check = 676 ft <sup>2</sup>
TOTAL = 14,450 ft <sup>2</sup>	TOTAL = 13,537 ft <sup>2</sup>

My calculations revealed that ACES total swale area resulted in a total of 13,537 ft<sup>2</sup> which is a total swale bottom area of 913 ft<sup>2</sup> ~ 6.32% smaller. I find it peculiar that all the stormwater swales are situated at the south and east sides of the site. The Existing North Basin area is almost half of the project area yet has no swale at or near its location and the stormwater is conveyed to the most southwest area of the site. The proposed parking lot at the east area of the site has a swale just to the east. This proposed parking lot has ample treatment capacity at swale #5. Additionally, the proposed storage building at the heart of the (BTAA) campus straddles the Existing West Basin and Existing East Basin. When the final calculations were performed,



all the stormwater was conveyed to a 6" storm water line connected to the SW most Swale #1 and has plenty of room to convey it.


Please be reminded that each of the 7 swales located along the east and south property lines are all connected hydraulically by adjoining pipes where eventually all the conveyed water makes its way to swale #1. At the SW region of Swale #1 there exist a stormwater pipe that is connected and is directed south out of the swale and is received by City of Ponderay Storm Water Department. I also ran additional storm water calculations for all 4 Predeveloped Basins and 1 Post Developed Basin with corrected basin areas & corrected swale areas. We also checked and corrected the Asphalt and Building areas and included them in the Stormwater Calculations.

In closing, I would like to reiterate my findings regarding my initial instructions. The open space of 75' x 100' at the NE area of the Thrift Store generated a treatment area of 615 ft<sup>2</sup> needed for the water coming from the 7,500 ft<sup>2</sup> open space, perhaps scheduled to becoming another parking lot someday. There is more than enough treatment area for this swale.

The proposed 65' x 50' Storage Building Stormwater calculation revealed the 5400 ft<sup>2</sup> lot with the 3250 ft<sup>2</sup> Storage Building on it will require a swale area of about 180 ft<sup>2</sup>. The existing swale at the SW portion of the site is configured with a bottom area of about 3227 ft<sup>2</sup>. The discharge produced for this building is small enough to be carried via the 6" storm water pipe. The west half of the southernmost Thrift Store closest to the 6" storm line was calculated for the first flow contribution, revealed a  $Q_{IN}=0.06\text{ft}^3/\text{sec.}$  (0.45 gals/sec.).

I would like to reiterate I am convinced that there is plenty of flow capacity in the 6" storm line from the Existing West Swale to the most northern area of the Thrift Store. With the three contribution points for storm water delivery resulting in a  $Q_{TOTAL}= 0.22 \text{ ft}^3/\text{sec.}$  (1.50 gals/sec.), there is "still" plenty of capacity in the 6" storm line. As was mentioned throughout this report capacity of this 6" is about  $Q_{IN}=0.58 \text{ ft}^3/\text{sec.}$  (4.3 gals/sec.). to the SW swale.

In my opinion there is ample storm water swale capacity throughout the project site, however lopsided it may be. I have presented the most thorough investigation I can, given some 16 years since the initial data was produced and this is what I relied on to produce this report. I trust I have addressed your concerns about the site regarding the storm water issue. I suspect if there were any serious concerns about the storm water issue, we would have been aware of it.

Sincerely,  
  
Kevin L. Stuss, P.E., L.S.I.T.  
Civil Engineer/Surveyor  
ACE Solutions, LLC  
Direct: 208.215.3627  
Email: [KevinS@acesolutions.pro](mailto:KevinS@acesolutions.pro)



# Stormwater Management Calculations

City of Ponderay, ID.

## Bowstring Method

22-091

Better Together Animal Alliance

Existing East Basin

Drainage Area = 92099 ft<sup>2</sup>

Time increment

5 min

Time of conetration

5 min

Outflow

0 cfs

1) input outflow (0.3 cfs 600 gal drywell,  
1.0 cfs 1000 gal drywell)

Design year

25

Area (sqft)

92099 sqft

2) input surface area for basin (in sqft)

Area (acres)

2.11 Ac

3) input the basins "C" factor

Area x "C"

1.90

Developed "C" factor

0.90

Time Inc. (min)	Time Inc. (sec)	Intensity (in / hr)	Q dev (cfs)	V in	V out	Storage
5	300	2.80	5.33	2142	0	2142
10	600	2.10	4.00	2805	0	2805
11	660	2.00	3.81	2900	0	2900
12	720	1.90	3.62	2972	0	2972
13	780	1.85	3.52	3105	0	3105
14	840	1.75	3.33	3137	0	3137
15	900	1.70	3.23	3241	0	3241
20	1200	1.60	3.04	3964	0	3964
25	1500	1.40	2.66	4268	0	4268
30	1800	1.20	2.28	4343	0	4343
35	2100	1.10	2.09	4609	0	4609
40	2400	0.95	1.81	4523	0	4523
45	2700	0.90	1.71	4799	0	4799
50	3000	0.87	1.66	5135	0	5135
55	3300	0.85	1.62	5503	0	5503
60	3600	0.78	1.48	5495	0	5495
65	3900	0.75	1.43	5711	0	5711
70	4200	0.70	1.33	5730	0	5730
75	4500	0.69	1.31	6042	0	6042
80	4800	0.67	1.27	6250	0	6250
85	5100	0.65	1.24	6434	0	6434
90	5400	0.63	1.20	6596	0	6596
95	5700	0.60	1.14	6624	0	6624
100	6000	0.59	1.12	6851	0	6851
105	6300	0.58	1.10	7066	0	7066
110	6600	0.55	1.05	7014	0	7014
115	6900	0.52	0.99	6928	0	6928
120	7200	0.5	0.95	6947	0	6947

Post Development

		Area(ft <sup>2</sup> )	Area(acres)	CN	Runoff	
Pavement			0.00		0.90	0.00
Gravel		92099	2.12		0.90	1.91



Building		0	0.00		0.90	0.00
Grass		0	0.00		0.60	0.00
Trees			0.00			0.00
	Totals	92099	2.1200		3.30	1.91

Developed "C" 0.90

25 year design (store or discharge 25 year / 2-hour storm event)  
max storage required (bowstring) 7066 cu ft Required Storage  
max storage provided cu ft does not include side slopes  
Dry wells required 0 Single Depth 0  
0 Double Depth  
Provided Treatment Area? 8523 (sqft)  
Provided Storage Volume? 4262 (cubic ft)

### Flush Mount Design

Flush Mount 4319 (sqft.) Aimp\*0.0469  
Treatment Area (sqft) Provided Does Provide Adequate Treatment Area.

### '208' Design Method

'208' Design (store first 1/2" of rainfall event prior to drywell)  
Required storage volume 3838 cu ft  
storage provided cu ft does not include side slopes

Treatment Volume (cubic ft)	
Required (Aimp*.5/12)	Provided
3837	4262

Treatment Area (sqft)	
Required (TreatVol/D)	Provided
7675	8523

D=Depth of Swale (0.5 Res or 0.67 Comm)

Treatment Area (sqft) Provided Does Provide Adequate Treatment Area.  
Storage Vol (ft^3) Provided Does Provide Adequate Storage Volume.

Residential 7674 square feet of swale to provide treatment at 6" depth.  
Commercial 5753 square feet of swale to provide treatment at 8" depth.

Drywells Directly Injected? (1 for Yes)	1
Total Impervious Surface	92099
Total Impervious Surface w/o Direct Injection	92099

208' Design will use 92099 for the impervious surface.

Stormwater Management Calculations  
City of Ponderay, ID.  
**Bowstring Method**

McNarny Basin  
Drainage Area = 18,623 ft<sup>2</sup>

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Time increment	5 min	
Time of conecration	5 min	
Outflow	0 cfs	1) input outflow (0.3 cfs 600 gal drywell, 1.0 cfs 1000 gal drywell)
Design year	25	
Area (sqft)	18623 sqft	2) input surface area for basin (in sqft)
Area (acres)	0.43 Ac	3) input the basins "C" factor
Area x "C"	0.38	
Developed "C" factor	0.90	

Time Inc. (min)	Time Inc. (sec)	Intensity (in / hr)	Q dev (cfs)	V in	V out	Storage
5	300	2.80	1.08	433	0	433
10	600	2.10	0.81	567	0	567
11	660	2.00	0.77	586	0	586
12	720	1.90	0.73	601	0	601
13	780	1.85	0.71	628	0	628
14	840	1.75	0.67	634	0	634
15	900	1.70	0.65	655	0	655
20	1200	1.60	0.62	802	0	802
25	1500	1.40	0.54	863	0	863
30	1800	1.20	0.46	878	0	878
35	2100	1.10	0.42	932	0	932
40	2400	0.95	0.37	915	0	915
45	2700	0.90	0.35	970	0	970
50	3000	0.87	0.33	1038	0	1038
55	3300	0.85	0.33	1113	0	1113
60	3600	0.78	0.30	1111	0	1111
65	3900	0.75	0.29	1155	0	1155
70	4200	0.70	0.27	1159	0	1159
75	4500	0.69	0.27	1222	0	1222
80	4800	0.67	0.26	1264	0	1264
85	5100	0.65	0.25	1301	0	1301
90	5400	0.63	0.24	1334	0	1334
95	5700	0.60	0.23	1339	0	1339
100	6000	0.59	0.23	1385	0	1385
105	6300	0.58	0.22	1429	0	1429
110	6600	0.55	0.21	1418	0	1418
115	6900	0.52	0.20	1401	0	1401
120	7200	0.5	0.19	1405	0	1405

Post Development

		Area(ft <sup>2</sup> )	Area(acres)	CN	Runoff	
Pavement		6000	0.14		0.90	0.13
Gravel		12623	0.29		0.90	0.26



Building		0	0.00		0.90	0.00
Grass		0	0.00		0.60	0.00
Trees			0.00			0.00
	Totals	18623	0.4300		3.30	0.39

Developed "C" 0.90

25 year design (store or discharge 25 year / 2-hour storm event)  
max storage required (bowstring) 1429 cu ft Required Storage  
max storage provided cu ft does not include side slopes  
Dry wells required 1 Single Depth 0  
0 Double Depth  
Provided Treatment Area? 7954 (sqft)  
Provided Storage Volume? 3977 (cubic ft)

### Flush Mount Design

Flush Mount 873 (sqft.) Aimp\*0.0469  
Treatment Area (sqft) Provided Does Provide Adequate Treatment Area.

### '208' Design Method

'208' Design (store first 1/2" of rainfall event prior to drywell)  
Required storage volume 776 cu ft  
storage provided cu ft does not include side slopes

Treatment Volume (cubic ft)	
Required (Aimp*.5/12)	Provided
776	3977

Treatment Area (sqft)	
Required (TreatVol/D)	Provided
1552	7954

D=Depth of Swale (0.5 Res or 0.67 Comm)

Treatment Area (sqft) Provided Does Provide Adequate Treatment Area.  
Storage Vol (ft^3) Provided Does Provide Adequate Storage Volume.

Residential 1552 square feet of swale to provide treatment at 6" depth.  
Commercial 1163 square feet of swale to provide treatment at 8" depth.

Drywells Directly Injected? (1 for Yes)	1
Total Impervious Surface	18623
Total Impervious Surface w/o Direct Injection	18623

208' Design will use 18623 for the impervious surface.

# Stormwater Management Calculations

City of Ponderay, ID.

## Bowstring Method

Existing North Basin

Drainage Area = 188,194 ft<sup>2</sup>

Time increment

Time of concentration

Outflow

Design year

Area (sqft)

Area (acres)

Area x "C"

Developed "C" factor

5 min

5 min

0 cfs

25

188194 sqft

4.32 Ac

3.89

0.90

22-091

Better Together Animal Alliance

1) input outflow (0.3 cfs 600 gal drywell,

1.0 cfs 1000 gal drywell)

2) input surface area for basin (in sqft)

3) input the basins "C" factor

Time Inc. (min)	Time Inc. (sec)	Intensity (in / hr)	Q dev (cfs)	V in	V out	Storage
5	300	2.80	10.89	4377	0	4377
10	600	2.10	8.17	5732	0	5732
11	660	2.00	7.78	5926	0	5926
12	720	1.90	7.39	6073	0	6073
13	780	1.85	7.19	6345	0	6345
14	840	1.75	6.80	6410	0	6410
15	900	1.70	6.61	6623	0	6623
20	1200	1.60	6.22	8100	0	8100
25	1500	1.40	5.44	8721	0	8721
30	1800	1.20	4.67	8875	0	8875
35	2100	1.10	4.28	9418	0	9418
40	2400	0.95	3.69	9242	0	9242
45	2700	0.90	3.50	9806	0	9806
50	3000	0.87	3.38	10494	0	10494
55	3300	0.85	3.31	11244	0	11244
60	3600	0.78	3.03	11228	0	11228
65	3900	0.75	2.92	11671	0	11671
70	4200	0.70	2.72	11709	0	11709
75	4500	0.69	2.68	12347	0	12347
80	4800	0.67	2.61	12771	0	12771
85	5100	0.65	2.53	13148	0	13148
90	5400	0.63	2.45	13478	0	13478
95	5700	0.60	2.33	13536	0	13536
100	6000	0.59	2.29	13999	0	13999
105	6300	0.58	2.26	14438	0	14438
110	6600	0.55	2.14	14333	0	14333
115	6900	0.52	2.02	14157	0	14157
120	7200	0.5	1.94	14196	0	14196

Post Development

		Area(ft <sup>2</sup> )	Area(acres)	CN	Runoff	
Pavement			0.00		0.90	0.00
Gravel		188194	4.33		0.90	3.90



Building		0	0.00		0.90	0.00
Grass		0	0.00		0.60	0.00
Trees			0.00			0.00
Totals		188194	4.3300		3.30	3.90

Developed "C" 0.90

25 year design (store or discharge 25 year / 2-hour storm event)  
max storage required (bowstring) 14438 cu ft Required Storage  
max storage provided cu ft does not include side slopes  
Dry wells required 1 Single Depth 0  
0 Double Depth  
Provided Treatment Area? (sqft)  
Provided Storage Volume? (cubic ft)

Per Stormwater report, all water is transferred to other basins

### Flush Mount Design

Flush Mount 8826 (sqft.) Aimp\*0.0469  
Treatment Area (sqft) Provided Does Not Provide Adequate Treatment Area.

### '208' Design Method

'208' Design (store first 1/2" of rainfall event prior to drywell)  
Required storage volume 7842 cu ft  
storage provided cu ft does not include side slopes

Treatment Volume (cubic ft)	
Required (Aimp*.5/12)	Provided
7841	0

Treatment Area (sqft)	
Required (TreatVol/D)	Provided
15683	0

D=Depth of Swale (0.5 Res or 0.67 Comm)

Treatment Area (sqft) Provided Does Not Provide Adequate Treatment Area.  
Storage Vol (ft^3) Provided Does Not Provide Adequate Storage Volume.

Residential 15682 square feet of swale to provide treatment at 6" depth.  
Commercial 11756 square feet of swale to provide treatment at 8" depth.

Drywells Directly Injected? (1 for Yes)	1
Total Impervious Surface	188194
Total Impervious Surface w/o Direct Injection	188194

208' Design will use 188194 for the impervious surface.

# Stormwater Management Calculations

City of Ponderay, ID.

## Bowstring Method

Existing West Basin

Drainage Area = 96372 ft<sup>2</sup>

Time increment

Time of conection

Outflow

Design year

Area (sqft)

Area (acres)

Area x "C"

Developed "C" factor

5 min

5 min

0 cfs

25

96372 sqft

2.21 Ac

1.99

0.90

22-091

Better Together Animal Alliance

1) input outflow (0.3 cfs 600 gal drywell,  
1.0 cfs 1000 gal drywell)

2) input surface area for basin (in sqft)

3) input the basins "C" factor

Time Inc. (min)	Time Inc. (sec)	Intensity (in / hr)	Q dev (cfs)	V in	V out	Storage
5	300	2.80	5.58	2241	0	2241
10	600	2.10	4.18	2935	0	2935
11	660	2.00	3.98	3035	0	3035
12	720	1.90	3.78	3110	0	3110
13	780	1.85	3.68	3249	0	3249
14	840	1.75	3.48	3282	0	3282
15	900	1.70	3.38	3392	0	3392
20	1200	1.60	3.19	4148	0	4148
25	1500	1.40	2.79	4466	0	4466
30	1800	1.20	2.39	4545	0	4545
35	2100	1.10	2.19	4823	0	4823
40	2400	0.95	1.89	4733	0	4733
45	2700	0.90	1.79	5021	0	5021
50	3000	0.87	1.73	5374	0	5374
55	3300	0.85	1.69	5758	0	5758
60	3600	0.78	1.55	5750	0	5750
65	3900	0.75	1.49	5976	0	5976
70	4200	0.70	1.39	5996	0	5996
75	4500	0.69	1.37	6323	0	6323
80	4800	0.67	1.33	6540	0	6540
85	5100	0.65	1.29	6733	0	6733
90	5400	0.63	1.25	6902	0	6902
95	5700	0.60	1.19	6932	0	6932
100	6000	0.59	1.17	7169	0	7169
105	6300	0.58	1.15	7393	0	7393
110	6600	0.55	1.10	7340	0	7340
115	6900	0.52	1.04	7250	0	7250
120	7200	0.5	1.00	7270	0	7270

Post Development

		Area(ft <sup>2</sup> )	Area(acres)	CN	Runoff	
Pavement			0.00		0.90	0.00
Gravel		96372	2.22		0.90	2.00



Building		0	0.00		0.90	0.00
Grass		0	0.00		0.60	0.00
Trees			0.00			0.00
Totals		96372	2.2200		3.30	2.00

Developed "C" 0.90

25 year design (store or discharge 25 year / 2-hour storm event)  
max storage required (bowstring) 7393 cu ft Required Storage  
max storage provided cu ft does not include side slopes  
Dry wells required 1 Single Depth 0  
0 Double Depth  
Provided Treatment Area? 2921 (sqft)  
Provided Storage Volume? 1461 (cubic ft)

Overflow provided by other basins

### Flush Mount Design

Flush Mount 4520 (sqft.) Aimp\*0.0469  
Treatment Area (sqft) Provided Does Not Provide Adequate Treatment Area.

### '208' Design Method

'208' Design (store first 1/2" of rainfall event prior to drywell)  
Required storage volume 4016 cu ft  
storage provided cu ft does not include side slopes

Treatment Volume (cubic ft)	
Required (Aimp*.5/12)	Provided
4016	1461

Treatment Area (sqft)	
Required (TreatVol/D)	Provided
8031	2921

D=Depth of Swale (0.5 Res or 0.67 Comm)

Treatment Area (sqft) Provided Does Not Provide Adequate Treatment Area.  
Storage Vol (ft^3) Provided Does Not Provide Adequate Storage Volume.

Residential 8032 square feet of swale to provide treatment at 6" depth.  
Commercial 6021 square feet of swale to provide treatment at 8" depth.

Drywells Directly Injected? (1 for Yes)	1
Total Impervious Surface	96372
Total Impervious Surface w/o Direct Injection	96372

208' Design will use 96372 for the impervious surface.

Stormwater Management Calculations  
City of Ponderay, ID.

**Bowstring Method**

Post Developed Basin

22-091

Drainage Area = 395,287 ft<sup>2</sup> (Entire Site.)

Better Together Animal Alliance

Time increment 5 min

Time of conection 5 min

Outflow 0.3 cfs

Min. outflow to drainage pipe

Design year 25

Area (sqft) 395287 sqft

2) input surface area for basin (in sqft)

Area (acres) 9.07 Ac

3) input the basins "C" factor

Area x "C" 3.93

Developed "C" factor 0.43

Time Inc. (min)	Time Inc. (sec)	Intensity (in / hr)	Q dev (cfs)	V in	V out	Storage
5	300	2.80	11.00	4421	90	4331
10	600	2.10	8.25	5790	180	5610
11	660	2.00	7.86	5986	198	5788
12	720	1.90	7.46	6134	216	5918
13	780	1.85	7.27	6409	234	6175
14	840	1.75	6.87	6475	252	6223
15	900	1.70	6.68	6690	270	6420
20	1200	1.60	6.28	8182	360	7822
25	1500	1.40	5.50	8809	450	8359
30	1800	1.20	4.71	8964	540	8424
35	2100	1.10	4.32	9514	630	8884
40	2400	0.95	3.73	9336	720	8616
45	2700	0.90	3.53	9905	810	9095
50	3000	0.87	3.42	10600	900	9700
55	3300	0.85	3.34	11358	990	10368
60	3600	0.78	3.06	11341	1080	10261
65	3900	0.75	2.95	11789	1170	10619
70	4200	0.70	2.75	11828	1260	10568
75	4500	0.69	2.71	12472	1350	11122
80	4800	0.67	2.63	12900	1440	11460
85	5100	0.65	2.55	13281	1530	11751
90	5400	0.63	2.47	13614	1620	11994
95	5700	0.60	2.36	13673	1710	11963
100	6000	0.59	2.32	14140	1800	12340
105	6300	0.58	2.28	14584	1890	12694
110	6600	0.55	2.16	14478	1980	12498
115	6900	0.52	2.04	14301	2070	12231
120	7200	0.5	1.96	14340	2160	12180

Post Development

	Area(ft <sup>2</sup> )	Area(acres)	CN	Runoff	
Pavement	30909	0.71		0.90	0.64
Gravel	0	0.00		0.90	0.00



Building		56606	1.30		0.90	1.17
Median Turf		307772	7.07		0.30	2.12
Trees			0.00			0.00
	Totals	395287	9.0800		3.00	3.93

Developed "C" 0.43

25 year design (store or discharge 25 year / 2-hour storm event)  
max storage required (bowstring) 12694 cu ft Required Storage  
max storage provided cu ft does not include side slopes  
Dry wells required 0 Single Depth 1  
0 Double Depth 0.3  
Provided Treatment Area? 13537 (sqft) This treatment area involves (7) different swales  
Provided Storage Volume? 6769 (cubic ft)

### Flush Mount Design

Flush Mount 1450 (sqft.) Aimp\*0.0469  
Treatment Area (sqft) Provided Does Provide Adequate Treatment Area.

### '208' Design Method

'208' Design (store first 1/2" of rainfall event prior to drywell)  
Required storage volume 16472 cu ft  
storage provided cu ft does not include side slopes

Treatment Volume (cubic ft)	
Required (Aimp*.5/12)	Provided
3646	6769

Treatment Area (sqft)	
Required (TreatVol/D)	Provided
7293	13537

D=Depth of Swale (0.5 Res or 0.67 Comm)

Treatment Area (sqft) Provided Does Provide Adequate Treatment Area.  
Storage Vol (ft^3) Provided Does Provide Adequate Storage Volume.

Residential 7292 square feet of swale to provide treatment at 6" depth.  
Commercial 5466 square feet of swale to provide treatment at 8" depth.

Drywells Directly Injected? (1 for Yes)	1
Total Impervious Surface	87515
Total Impervious Surface w/o Direct Injection	30909

208' Design will use 30909 for the impervious surface.





# BASIN MAP FOR BETTER TOGETHER ANIMAL ALLIANCE

A PORTION OF SECTION 2, T57N, R2W, B.M., CITY OF PONDERAY, BONNER COUNTY, IDAHO

NO BOUNDARY SURVEY

PROPERTY LINES SHOWN ARE APPROXIMATE. THIS  
MAP DOES NOT CONSTITUTE AN ADJUDICATORY SURVEY  
BY AGE SOLUTIONS.

DATE: 1/27/23  
DRAWN BY: AGE  
CHECKED BY: AGE  
PROJECT: 22-001



AGE SOLUTIONS  
1900 Main Street  
P.O. Box 100  
Ponderay, ID 83854  
PHONE: (208) 777-1218  
FAX: (208) 777-1218  
www.agesolutions.com

ORIGINAL ON FILE AT AGE SOLUTIONS

1900 Main Street  
P.O. Box 100  
Ponderay, ID 83854

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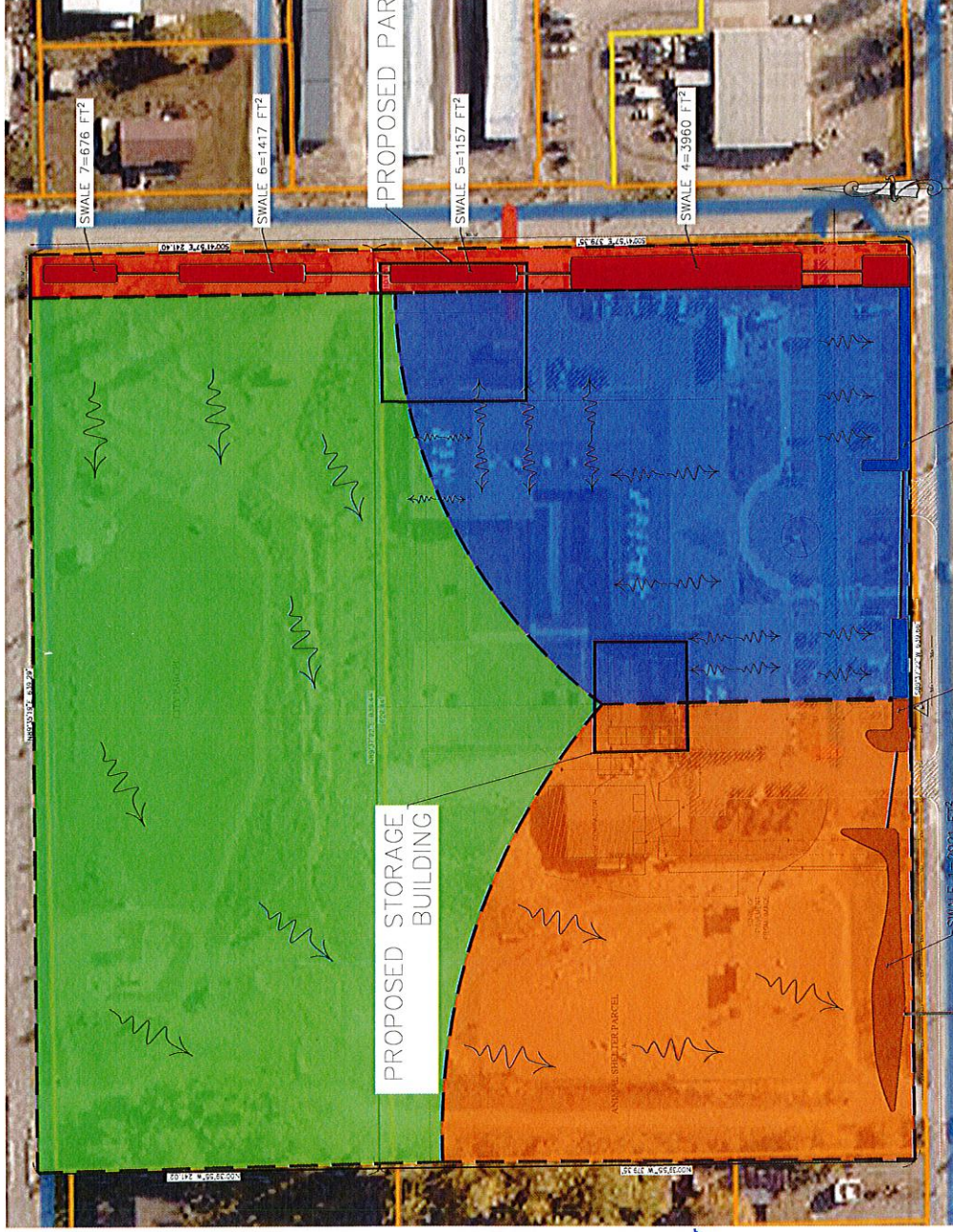
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SWALE 1=2206 FT  
SWALE 2=1200 FT  
SWALE 3=2206 FT  
SWALE 4=3960 FT  
SWALE 5=1157 FT  
SWALE 6=1417 FT  
SWALE 7=676 FT

PROPOSED STORAGE BUILDING

PROPOSED PARKING LOT

EXIT DRAINAGE PIPE TO PONDERAY STORM WATER TREATMENT

SWALE 1=2206 FT

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